

What Is Claimed Is:

1. A composite roving used for making structural composites comprising:

a continuous fiber bundle of a first fiber type, said continuous fiber bundle having a plurality of inner fibers and a plurality of outer fibers coupled together with a high integrity sizing material; and

a powder coating applied to an outer portion of said plurality of outer fibers.

2. The composite roving of claim 1, wherein said first fiber type is selected from the group consisting of e-type glass, s-type glass, carbon fiber, aramid fibers, synthetic fibers, and natural fibers.

3. The composite roving of claim 1, wherein said powder coating comprises between approximately ten and eighty percent by weight of the dry total weight the composite roving.

4. The composite roving of claim 1, wherein said powder coating comprises between approximately twenty and thirty percent by weight of the dry total weight the composite roving.

5. The composite roving of claim 1, wherein said powder coating is selected from the group consisting of a polyester powder coating, a bisphenol-type epoxy powder coating, a novalac epoxy powder coating, a phenolic powder coating, a hybrid epoxy and polyester powder coating, a polyurethane powder coating, and an acrylic powder coating.

6. The composite roving of claim 1, wherein said powder coating is a thermoplastic powder coating.

7. A method for forming a composite roving for use in structural composites comprising the steps of:

forming a sized fiber bundle of a first type having high structural integrity;

applying a first amount of an aqueous powder coating to an outer portion of said sized fiber bundle form a coated fiber bundle; and

drying said coated fiber bundle to remove water from said aqueous powder coating.

8. The method of claim 7, wherein the step of applying a first amount of an aqueous powder coating comprises the steps of:

dipping said sized fiber bundle into an aqueous slurry of a powder coating material; and

metering the amount of said aqueous slurry applied to said sized fiber bundle to a first amount.

9. The method of claim 8, wherein the step of metering the amount of said aqueous slurry applied to said sized fiber bundle to a first amount comprises the step of metering the amount of said aqueous slurry applied to said sized fiber bundle to a first amount using a stripper die.

10. The method of claim 8, wherein the step of metering the amount of said aqueous slurry applied to said sized fiber bundle to a first amount comprises the step of metering the amount of said aqueous slurry applied to said sized fiber bundle to a first amount using a squeegee.

11. A method for forming a structural composite part comprising the steps of:

forming a sized fiber bundle of a first type having high structural integrity, said sized fiber bundle comprising a plurality of inner fibers and a plurality of outer fibers and a high integrity sizing composition;

applying a first amount of an aqueous powder coating to an outer portion of said plurality of outer fibers to form a coated fiber bundle; and

drying said coated fiber bundle to form a composite roving, wherein the weight of said plurality of inner fibers and said plurality of outer fibers within said composite roving comprises between approximately ten and eighty percent of the dry total weight of said coated fiber bundle;

chopping said composite roving into a plurality of chopped strands having a first length; and

compression molding said plurality of chopped strands to a desired shape to form the structural composite part.

12. The method of claim 11, wherein the step of applying a first amount of an aqueous powder coating comprises the steps of:

dipping said sized fiber bundle into an aqueous slurry of a powder coating material; and

metering the amount of said aqueous slurry applied to said sized fiber bundle to a first amount.

13. The method of claim 11, wherein the step of metering the amount of said aqueous slurry applied to said sized fiber bundle to a first amount comprises the step of metering the amount of said aqueous slurry applied to said sized fiber bundle to a first amount using a stripper die.

14. The method of claim 11, wherein the step of metering the amount of said aqueous slurry applied to said sized fiber bundle to a first amount comprises the step of metering the amount of said aqueous slurry applied to said sized fiber bundle to a first amount using a squeegee.

15. The method of claim 11, wherein the step of drying said coated fiber bundle to form a composite roving comprises the step of air-drying said coated fiber bundle to form a composite roving, wherein the weight of said

plurality of inner fibers and said plurality of outer fibers within said composite roving after the drying step comprises between approximately ten and eighty percent of the total dry weight of said coated fiber bundle.

16. The method of claim 11, wherein the step of drying said coated fiber bundle to form a composite roving comprises the step of heating said coated fiber bundle in a drying oven to remove a quantity of water from said aqueous powder coating to form a composite roving, wherein the weight of said plurality of inner fibers and said plurality of outer fibers within said composite roving after the drying step comprises between approximately ten and eighty percent of the total dry weight of said coated fiber bundle.

17. The method of claim 11, wherein the step of drying said coated fiber bundle to form a composite roving comprises the step of air-drying said coated fiber bundle to remove a quantity of water from said aqueous powder coating to form a composite roving, wherein the weight of said plurality of inner fibers and said plurality of outer fibers within said composite roving after the air-drying step comprises between approximately ten and eighty percent of the total weight of said coated fiber bundle.

18. The method of claim 11, wherein the step of chopping said composite roving into a plurality of chopped strands comprising the steps of chopping said composite roving in the presence of a hot air source device, wherein said hot air source device partially melts and tackifies said powder coating material on said composite roving; and impacting said composite roving on a mold surface with sufficiently high temperature to keep said powder coating material tackified without reversibly curing said powder coating material.

19. The method of claim 11, wherein the step compression molding said plurality of chopped strands to a desired shape to form the structural composite part comprises the steps of:

placing said plurality of chopped strands onto a preforming screen to form a preform;

heat consolidating said preform to form a handleable preform;

placing said handleable preform between a lower mold section and an upper mold section of a press;

compressing said handleable preform between said lower mold section and said upper mold section of said press for a predetermined amount of time at a predetermined pressure and at a predetermined elevated temperature of said upper mold section sufficient to melt, flow and cure a powder coating material contained within said composite roving to form the structural composite part; and releasing the structural composite part from said press.

20. The method of claim 19, wherein said predetermined elevated temperature is between approximately 300 and 450 degrees Fahrenheit and said predetermined pressure is between approximately 300 and 1200 pounds per square inch.

21. The method of claim 11, wherein the step compression molding said plurality of chopped strands to a desired shape to form the structural composite part comprises the steps of:

placing said plurality of chopped strands onto a moving belt;

compacting and heating said plurality of chopped strands to form a preform;

cutting said preform to a desired size and shape;

placing at least one layer of said preform between a lower mold section and an upper mold section of a press;

compressing said preform between said lower mold section and said upper mold section of said press for a predetermined amount of time at a

predetermined pressure and at a predetermined elevated temperature of said upper mold section sufficient to melt, flow and cure a powder coating material contained within said composite roving to form the structural composite part; and
releasing the structural composite part from said press.

22. The method of claim 21, wherein said predetermined elevated temperature is between approximately 300 and 450 degrees Fahrenheit and said predetermined pressure is between approximately 300 and 1200 pounds per square inch.

23. A method for forming a structural composite part comprising the steps of:

forming a sized fiber bundle of a first type having high structural integrity, said sized fiber bundle comprising a plurality of inner fibers and a plurality of outer fibers and a high integrity sizing composition;

applying a first amount of an aqueous powder coating to an outer portion of said plurality of outer fibers to form a coated fiber bundle; and

drying said coated fiber bundle to form a composite roving, wherein the weight of said plurality of inner fibers and said plurality of outer fibers within said composite roving comprises between approximately ten and eighty percent of the dry total weight of said coated fiber bundle;

coupling a plurality of strands of said composite roving to form a fabric;

placing at least one layer of said fabric in a mold; and

compression molding said at least one layer of fabric at a predetermined temperature and a predetermined pressure to form the structural composite part.

24. The method of claim 23, wherein the step of coupling a plurality of strands of said composite roving to form a fabric comprises the step of weaving a plurality of strands of said composite roving to form a fabric.

25. The method of claim 23, wherein the step of coupling a plurality of strands of said composite roving to form a fabric comprises the step of knitting a plurality of strands of said composite roving to form a fabric.

26. The method of claim 23, wherein the step of coupling a plurality of strands of said composite roving to form a fabric comprises the step of braiding a plurality of strands of said composite roving to form a fabric.